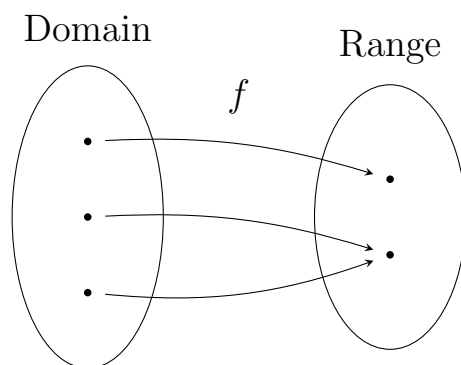
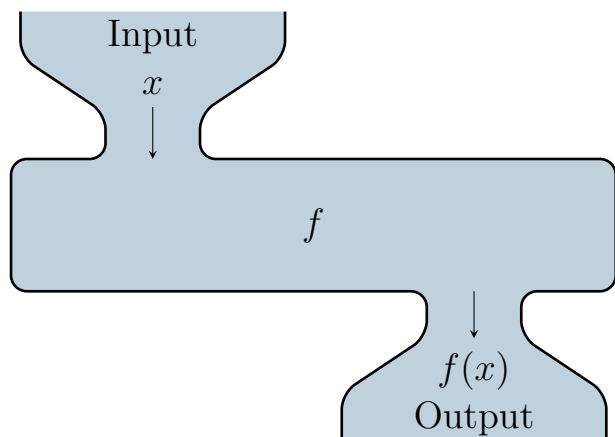


## 2.1: Functions and Their Graphs

### Definition.

A **function** is a rule that assigns to each element in a set  $A$  one and only one element in a set  $B$ .

In the context above, the set  $A$  is called the **domain**, and the set  $B$  is called the **range**.



**Example.** Let  $f(x) = 2x^2 - 2x + 1$ . Evaluate the following

$$f(1)$$

$$f(-2)$$

$$f(a)$$

$$f(a + h)$$

**Example.** Find the domain and range of the following functions:

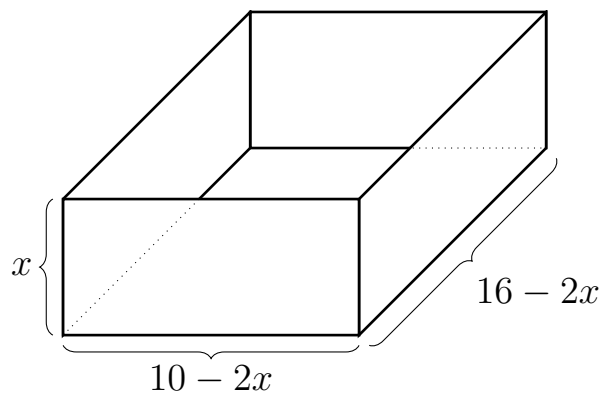
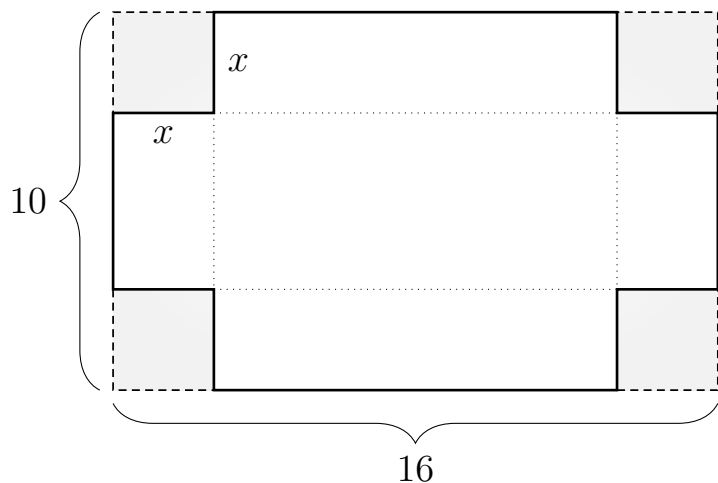
$$f(x) = x$$

$$A = \pi r^2$$

$$y = \sqrt{x - 1}$$

$$y = \frac{1}{x^2 - 4}$$

**Example.** An open box is to be made from a rectangular piece of cardboard 16 inches long and 10 inches wide by cutting away identical squares ( $x$  inches by  $x$  inches) from each corner and folding up the resulting flaps. Find an expression that gives the volume  $V$  of the box as a function of  $x$ . What is the domain of the function?



**Definition.**

A **piecewise** function is a function with different definitions for different portions of the domain.

**Example.** Rewrite the following as piecewise functions:

$$|x| = \qquad \qquad \qquad \frac{x}{|x|} =$$

$$|x - 1| + |4 - x| =$$

**Definition. (Vertical Line Test)**

A curve in the  $xy$ -plane is the graph of a function  $y = f(x)$  (an explicit function) if and only if each vertical line intersects it in at most one point

**Example.** Use the vertical line test on the following graphs to determine which graphs may represent an explicit function:

